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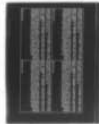
ADVISORY GROUP FOR AEROSPACE RESEARCH AND DEVELOPMENT--ETC F/G 6/5  
TECHNICAL EVALUATION REPORT ON THE AEROSPACE MEDICAL PANEL LOND--ETC(U)  
JAN 79 J TRIEBWASSER, M C LANCASTER

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NORTH ATLANTIC TREATY ORGANIZATION

ADVISORY GROUP FOR AEROSPACE RESEARCH AND DEVELOPMENT

(ORGANISATION DU TRAITE DE L'ATLANTIQUE NORD)

AGARD Advisory Report No. 131

TECHNICAL EVALUATION REPORT

on the

AEROSPACE MEDICAL PANEL

LONDON SPECIALISTS' MEETING, FALL 1977

on

PROSPECTIVE MEDICINE OPPORTUNITIES IN AEROSPACE  
MEDICINE and

by

Dr J. Triebwasser  
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USAF Medical Center WP  
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USA

and

SPECIFIC FINDINGS IN CARDIOLOGY AND PULMONARY FUNCTION  
WITH SPECIAL EMPHASIS ON ASSESSMENT CRITERIA FOR FLYING

by

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REF ID: A67116  
APR 5 1979  
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The Proceedings of the AGARD Aerospace Medical Panel's 34th Panel Meeting/Specialists' Meeting, held in London, United Kingdom, 24-28 October 1977 are published as CP 231 ("Prospective ....") and CP 232 ("Specific ...."), both issued in September 1978

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- Providing scientific and technical advice and assistance to the North Atlantic Military Committee in the field of aerospace research and development;
- Rendering scientific and technical assistance, as requested, to other NATO bodies and to member nations in connection with research and development problems in the aerospace field;
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- Recommending effective ways for the member nations to use their research and development capabilities for the common benefit of the NATO community.

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Published January 1979

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ISBN 92-835-1307-X



Printed by Technical Editing and Reproduction Ltd  
Harford House, 7-9 Charlotte St, London, W1P 1HD




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 Panel Deputy Chairman: Air Commodore J.N.C.Cooke, RAF  
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**PROSPECTIVE MEDICINE OPPORTUNITIES IN  
AEROSPACE MEDICINE**

Edited by

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**PREFACE**

The purpose of prospective medicine is to identify the propensity for disease development at a stage long before clinical pathology can be detected and then to intervene in the process to positively modify prognosis. Proper utilization of currently available data related to readily identifiable risk factors would allow concentration of medical interest within a relatively small segment of the population from which the majority of medical problems will become manifest, without sacrifice of good medical care for the remainder, and without detriment to flying safety.

Prospective medicine promotes intervention in the disease process before the disease becomes clinically significant and thus offers a real opportunity to significantly reduce manpower losses. The prospective medicine approach could also form the basis for significant revision of current selection and retention criteria for the military aircrewmembers.

The following papers discussed various applications of prospective medicine techniques to the practice of aerospace medicine. These papers dealt with studies conducted in the special population of military aircrew on the prevalence/incidence of findings, including multiple risk assessments, correlation of these with disease risks, and the results of efforts to modify the risk for disease and its clinical manifestations.



## SUMMARY

This panel meeting identified the importance of prospective medicine opportunities in the practice of Aerospace Medicine. Modification of "self imposed risks" resulting from western life styles demands immediate emphasis. Methods for early disease detection are required to assure optimum air crew selection criteria and to maintain air crew effectiveness in an increasingly stressful environment.

Health screening and risk modification programs have several important limitations. Screening tests often lack optimum sensitivity and specificity. This problem is further compounded by the difficulty in defining when a given abnormal test result has potential aeromedical significance. Risk modification is often suboptimal due to limitations of resources and the lack of adequate evidence that the modification of certain specific risk factors have long term beneficial effects. Problems requiring further research and how the latter should be approached were outlined.

## TECHNICAL EVALUATION REPORT

The AGARD Aerospace Medical Panel's 34th Panel meeting on "Prospective Medicine Opportunities in Aerospace Medicine" was held in London, United Kingdom, 24-28 October 1977.

Twelve papers were presented. The authors discussed the value and limitations of health assessment programs in terms of identifying a population at risk for the development of diseases having aeromedical significance and several approaches having the potential of preventing disease and modifying risk for incapacitating events. Cardiovascular disease identification and prevention received major emphasis. A summary of the discussion and the participants in the discussion can be found at the end of each paper.

Three major problem areas were addressed:

1. The design and potential value of screening physical examinations and other health appraisal methods for the identification of aircrew members at risk for manifestations of disease having aeromedical significance: A1, A2, A3, A4, A5, A11, A12.

2. Methods for modifying risk with emphasis on disease prevention: A1, A2, A5, A10. Paper A8 was not presented or discussed.

3. Definition of the significance of abnormal findings resulting from health appraisals conducted within an apparently healthy aircrew population: A6, A7, A9.

### CONCLUSIONS:

These presentations clearly identified the impact cardiovascular disease has on the readiness of our military forces and on flying safety. Although there is no overwhelming proof that modification of risk factors known to be associated with diseases having aeromedical significance will halt the progression of the latter or prevent its clinical manifestations, the majority of the participants agreed major emphasis should be given to risk identification and intervention. The views expressed concerning how health appraisals and risk modifications were to be conducted covered a wide spectrum. This was largely due to the conferees' differences in their available resources and the types of air crew members they served (e.g., single seat fighter pilots versus those aviators flying multipiloted transport aircraft).

Much discussion was given to the value and limitations of the various tests used to identify subclinical disease and risk for subsequent incapacitating events. All of the conferees agreed our present methods for identifying risk lacks specificity and that more definitive noninvasive tools must be identified. The limitations of exercise electrocardiography received considerable emphasis. The conferees could not agree as to how an abnormal result should be approached. The spectrum of opinions ranged from doing nothing other than modifying life style to performing coronary arteriography.

It was agreed a basic problem underlying all health screening methods was the difficulty in defining what is normal. At present, an abnormal finding is defined as a normal variant having little, if any, aeromedical significance by excluding underlying organic disease using tools lacking sensitivity and/or specificity. Ventricular premature beats are such an example. Even when the tools accurately measure a blood constituent or blood pressure level, there is the problem of defining what level is abnormal and when it should be modified.

Much discussion was given to the management of hypertension in the aircrew member. The participants did not agree when and how therapy should be implemented. The potential undesirable effects of antihypertensive therapy received considerable emphasis. Commonly acceptable drugs such as the "beta blockers" have potential central nervous system effects which may preclude their use in the aviator.

In summary, this meeting clearly identified the potential value of prospective medicine and some of the major limitations of health appraisal and risk modification programs. The panel discussions did provide the basic framework for developing prospective medicine programs in the representative Air Forces. A universal approach could not be defined at the present time, largely due to differences in available resources and the types of aviators under consideration. The major value of this meeting was to share experiences and to offer the framework for future studies that will identify solutions to many of the problems discussed.

### RECOMMENDATIONS:

No specific recommendations were unanimously offered by the conferees. All agreed risk identification and modification deserved emphasis in the practice of Aerospace Medicine. "Self imposed risks" such as cigarette smoking require immediate attention.

By implication, the majority of the conferees expressed the opinion that more research including the use of long term prospective studies were necessary to define the indications for some of the screening tests which, at present, appear to lack optimum specificity. The goals of these studies were defined to identify how and when such tests are to be implemented, and how an abnormal result was to be approached from an aeromedical standpoint.

The majority of the participants agreed more specific standards must be developed for the high performance fighter pilot. A common approach to this unique subgroup was felt to be highly desirable.



**SPECIFIC FINDINGS IN CARDIOLOGY AND PULMONARY FUNCTION WITH  
SPECIAL EMPHASIS ON ASSESSMENT CRITERIA FOR FLYING**

Edited by

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**PREFACE**

Cardiopulmonary diseases constitute the most significant health problem in the military forces of the NATO countries in terms of death and premature disability. The cost of these diseases to the military forces is very significant when viewed either in monetary terms or in terms of mission capability. And yet, because of the select nature of the military population much of the information gathered in civilian hospital populations concerning the significance of medical findings is not directly applicable to the military population. It is, therefore, especially appropriate that this session be held to discuss and share information in this important aspect of aerospace medicine.

The following papers presented valuable data on normal values, natural history, performance of testing methods, assessments of newer techniques for disease detection and definition and, very importantly, philosophies of determination of fitness to fly. These discussions are a significant contribution to aerospace medicine and both enhance the current understanding of cardiopulmonary problems in flying personnel and provide important insights into the research and development needs within the NATO countries.

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## SUMMARY

This conference brought together an impressive number of experts from the participating NATO nations in an atmosphere conducive to both learning and teaching. The conference pointed out new techniques, new data, and new philosophies in cardiopulmonary aspects of aerospace medicine. But the conference also did more; it provided the environment to share and discuss problems, point out deficiencies of knowledge and technology and to combine experience to set the goals for the future.

The overall impact of a conference such as this one cannot be quantified but the variety of subject material can clearly be seen to have been educational. The discussions in most subject areas pooled many years of individual experience, and from that viewpoint alone must have stimulated the participants to renew their individual efforts to formulate the questions we face with care and to document the answers in a manner that contributes to our total understanding of the flyer as a member of a special occupation that requires unique medical consideration.



## TECHNICAL EVALUATION REPORT

The AGARD NATO Aerospace Medical Panel Specialist Meeting on "Specific Findings in Cardiology and Pulmonary Function with Special Emphasis on Assessment Criteria for Flying" was held in London, United Kingdom, 24-28 October 1977.

Twenty-one papers were presented. Four papers dealt directly with pulmonary function testing or findings: B1, B2, B3, and B4. The remaining papers dealt with cardiovascular disease, either diagnostic methodology, significance of findings with respect to fitness to fly, or a combination of these subjects.

### Conclusions and Recommendations:

These presentations have highlighted a few examination techniques and discussed their potential for application to the examination of flying personnel. Both the presentations and discussions have elucidated some of the deficiencies and problems associated with each of these techniques, as well as their positive aspects.

The relatively new flow-volume curves in pulmonary function seem to offer some advantages over conventional spirometry where volume is recorded against time. The flow-volume curve takes less time, is less influenced by patient effort and may be more sensitive. The technique is in use in many centers and complements standard spirometric techniques.

The ability to apply the advantages of the body plethysmography to a stress test offers the potential of earlier detection of obstructive lung disease, well before it could be recognized in the resting state. It may also be an effective tool to better quantitate the effects of early disease upon performance in a stressful environment such as flying.

Two papers presented epidemiologic data relative to pulmonary function in flyers. Data in the specific population of interest to the flight surgeon is always of real value since so much of the available data in the medical literature is from a non-comparable population and direct inferences are subject to serious error.

This session also contained presentations of some newer diagnostic techniques in cardiology, some evaluation and standardization of older techniques and some discussions of the relevance of certain findings to flying fitness. There can be no doubt that detection of coronary disease is of signal importance in the flying population and the electrocardiogram remains the most widely used tool for screening purposes. The exercise ECG has been shown to add significantly to the detection of underlying coronary disease, but in spite of the fact that exercise stress testing has been widely used now for many years, there remains a problem of lack of standardization, both in testing protocols and in criteria. The very real problem of false positive exercise stress tests was a topic of considerable discussion during this meeting and the influence of disease prevalence upon test results was pointed out. There is considerable promise that other safe, non-invasive tests will improve the detection of disease. Although the initial results of myocardial imaging with radio-isotopes presented at this meeting showed some problems in the flying population, these studies are new and may still prove to be valuable adjunct to other diagnostic studies. In contrast, the initial experiences with echocardiography as an important diagnostic tool are very positive and the promise of its contribution in the future is exciting, as was pointed out in this session. Systolic time intervals are another non-invasive technique that adds specificity to our test battery in certain cases.

The significance of a finding in an otherwise apparently healthy individual is nowhere more pertinent than in aviation medicine. This conference discussed a very frequent problem that has been present for a very long time, namely T-wave abnormalities and attempts to further elucidate their significance by pharmacologic means. Another significant problem discussed was that of left anterior hemiblock, and its pertinence to aeromedical risk. There has been considerable over diagnosis of left anterior hemiblock (LAH) which appears to be due to failure to understand the nature of left axis deviation and also to the failure in applying proper criteria consistently. It was pointed out in this session that the risk of LAH in apparently healthy individuals such as aircrewmembers has not yet been clarified. It is of marked importance to study each individual well and to attempt to learn what LAH means prognostically in our population.

The availability of electrophysiologic studies of the cardiac conduction system is an exciting new addition to our ability to determine the significance of findings. Certainly His bundle electrograms seem to offer a very direct answer to the more complete evaluation of conduction disturbances, like LAH discussed in this session. It also is a technique which has potential for application to the determination of risk in rhythm disturbances. With proper equipment for pacing, one may be able to differentiate those rhythm disturbances that have a potential for incapacitation from those that do not. The precise place of this invasive procedure in aviation medicine is yet to be defined but this session has appropriately pointed out its potential.

The subject of cardiovascular fitness for flying was a major topic of this session. There exists fairly widely divergent opinion concerning the extent of examination that is acceptable in flying personnel in general, but this divergence was most striking with respect to civil aviation. The cost of examination coupled with the cost of loss of aircrew is an important problem to all parts of aviation but becomes a primary decision point in civil aviation. The need for increased preventive measures for atherosclerotic disease seemed to be agreeable to all participants but the exact methods to be used and the value received seems yet undefined. The point of division between stricter criteria to promote flying safety while taking care not to waste aircrew unnecessarily has not as yet been determined, but this session clearly created an open form of discussion on this vital subject. One hopes that continued work and repeated sharing of experiences will hasten the day in which a more suitable answer can be given.



REPORT DOCUMENTATION PAGE											
1. Recipient's Reference	2. Originator's Reference AGARD-AR-131	3. Further Reference ISBN 92-835-1307-X	4. Security Classification of Document UNCLASSIFIED								
5. Originator	Advisory Group for Aerospace Research and Development North Atlantic Treaty Organization 7 rue Ancelle, 92200 Neuilly sur Seine, France										
6. Title	TECHNICAL EVALUATION REPORT on the AEROSPACE MEDICAL PANEL LONDON SPECIALISTS' MEETING, FALL 1977										
7. Presented at											
8. Author(s)/Editor(s) Edited by J. Triebwasser and M.C. Lancaster	9. Date January 1979										
10. Author's/Editor's Address	11. Pages 12										
12. Distribution Statement	This document is distributed in accordance with AGARD policies and regulations, which are outlined on the Outside Back Covers of all AGARD publications.										
13. Keywords/Descriptors											
<table border="0"> <tr> <td>Aerospace medicine</td> <td>Heart diseases</td> </tr> <tr> <td>Research projects</td> <td>Pilots (personnel)</td> </tr> <tr> <td>Research management</td> <td>Meetings</td> </tr> <tr> <td>Cardiology</td> <td></td> </tr> </table>				Aerospace medicine	Heart diseases	Research projects	Pilots (personnel)	Research management	Meetings	Cardiology	
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